

DRIFTWOOD STATE FISHING AREA
Johnson/Bartholomew County
2005 Creel Survey and Fish Management Report

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EXECUTIVE SUMMARY

- The Driftwood State Fishing Area (SFA) straddles the line between Johnson and Bartholomew Counties. It is located in south-central Indiana along U.S. 31 west of Edinburgh. It covers 263 acres of land and includes three gravel pits: Plover Pit (67 acres), Sandpiper Pit (17 acres), and Meadowlark Pit (2.5 acres). The property is maintained by personnel from nearby Atterbury State Fish and Wildlife Area.
- A creel survey was conducted at Driftwood SFA from April 1 through October 31, 2005. It was estimated that 10,476 anglers fished for 26,108 h at Driftwood SFA to harvest 4,228 fish (49 fish/acre) that weighed 2,081 lbs (24 lbs/acre). Total fishing pressure equaled a minimum of 302 h/acre and the harvest rate equaled 0.16 fish/h. In 1994, the total fishing pressure was greater (530 h/acre), but the harvest rate was less (0.11 fish/h). In July 2005, the fishing pressure was greatest but the harvest rate was the least. The abundance of crappie harvested in April plays a major role in the 0.38 fish/h harvest rate in April.
- The estimated economic value of the fishery at these three gravel pits during the creel survey period was approximately \$383,003. According to the interviews, the typical angler was a satisfied angler from Johnson County that fishes at Driftwood SFA because it is close to home. Out of 1,995 angler parties, 87% were satisfied with the fishing experience and 67% fished here because it was convenient and/or close to home.
- More than a third of angler parties (39%) were fishing for anything. Twenty-seven percent of angler parties were fishing for largemouth bass, 9% for bluegill, 6% for crappie, and 6% for channel catfish. Another 9% of angler parties were fishing for various combinations of these four species. Five percent of angler parties said they were fishing for muskie or some combination with muskie.
- According to harvest results observed in the creel survey, bluegill ranked first by number, followed by crappie, redear sunfish, and channel catfish. Two muskies were observed in the harvest.
- Also in 2005, general fishery surveys were completed on Sandpiper Pit on June 27 to 28, Plover Pit on July 18 to 19, and Meadowlark Pit on October 11 to 13. Water chemistry and aquatic vegetation data were also collected.
- At Sandpiper, a total of 269 fish, representing 11 species and hybrid sunfish, was collected during this survey. By number, largemouth bass ranked first, bluegill ranked second, and redear sunfish ranked third in the survey sample. By weight, largemouth bass ranked first followed by two common carp and one silver redhorse.
- At Plover, a total of 157 fish, representing 13 species and hybrid sunfish, was collected during this survey. By number, largemouth bass ranked first, bluegill ranked second, and

warmouth ranked third in the survey sample. By weight, largemouth bass ranked first followed by one common carp and one longnose gar.

- At Meadowlark, a total of 529 fish, representing 14 species and hybrid sunfish, was collected during this survey. By number, bluegill ranked first, largemouth bass ranked second, and redear sunfish ranked third in the survey sample. By weight, largemouth bass ranked first followed by two common carp and ten large gizzard shad.
- The Bluegill Fishing Potential index was greatest at Meadowlark with a 14, followed by Sandpiper with a 13 and Plover with a 9. Meadowlark had a *marginal* PSD, *poor* growth, but had *good* density; it was the only pit from which a bluegill longer than 8 in was collected. Sandpiper had an *excellent* PSD, *marginal* growth, and *fair* density. Plover had a *good* PSD and *marginal* growth, but *poor* density.
- The DFW should conduct sequential sampling in the spring to determine a better PSD for largemouth bass and the need for a largemouth bass slot-limit.
- The DFW should continue to stock channel catfish and muskie at Driftwood SFA according to the catfish and muskie stocking programs.
- Submersed vegetation should continue to be monitored, especially the populations of Eurasian watermilfoil. Signs should be posted to warn boaters of the presence of Eurasian watermilfoil and curlyleaf pondweed and to remind them to clean their boats before leaving Driftwood SFA for another body of water.

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INTRODUCTION

The Driftwood State Fishing Area (SFA) straddles the line between Johnson and Bartholomew Counties. It is located in south-central Indiana along U.S. 31 west of Edinburgh (Figure 1). The 263-acre site, which was purchased from the Jefferson Sand and Gravel Company by the Indiana Department of Natural Resources (IDNR) in February of 1981, included three gravel pits: Plover Pit (67 acres), Sandpiper Pit (17 acres), and Meadowlark Pit (2.5 acres). The property is maintained by personnel from nearby Atterbury State Fish and Wildlife Area.

Most of the shoreline of Plover and Sandpiper is relatively steep and the bottom drops off quickly to depths of 20 or 30 ft. Meadowlark also has some steep shoreline areas but it is not as deep as the other two pits. Concrete boat ramps at Plover and gravel ramps at Sandpiper and Meadowlark provide good access for boat anglers (Figure 1); only electric trolling motors are allowed. Each pit generally provides good access for shoreline anglers as well. This is one of the reasons that this area is so popular with anglers.

Complete stocking records are not available for the pits. Gravel pit personnel stocked largemouth bass, bluegill, and crappie before the area became an IDNR property. In addition, the Driftwood River occasionally runs around a levee to flood the area, allowing river fishes such as gizzard shad, brook silverside, channel catfish, flathead catfish, logperch, smallmouth bass, spotted bass, rock bass, warmouth, common carp, and suckers to enter the pits.

All three pits have a 14-in minimum size limit on largemouth bass. Plover Pit is stocked with 1,675 (25/acre) channel catfish every two years. Sandpiper Pit is stocked with 850 (50/acre) channel catfish and Meadowlark Pit is stocked with 250 (100/acre) channel catfish annually. Tiger muskie were stocked in Plover from 1983 to 1996 and in Sandpiper in 1995. Pure muskie have been stocked since 1997. Plover Pit is currently stocked with 335 (5/acre) muskies annually. Sandpiper Pit is currently stocked with 85 (5/acre) muskies annually. The creel and fishery surveys were conducted to evaluate fish population changes since the last surveys in 1994.

METHODS

Creel Survey

A direct-contact type creel survey was conducted at Driftwood SFA from April 1 through October 31, 2005 (214 d). It followed the general creel survey guidelines as described by Hudson and Shipman (1980). In April, May, June, September, and October, the fishing day was 15 h. In July and August, the fishing day was 16 h. All days were divided into two 7.5-h periods with the morning period running from 6:00 AM to 1:30 PM. In April, May, June, September, and October, the evening period ran from 1:30 PM to 9:00 PM. In July and August, the evening period ran from 2:30 PM to 10:00 PM. Only one 7.5-h period was sampled by the clerk per fishing day.

The creel clerk interviewed angler parties either during the morning or the evening period on 7 weekdays and 3 weekend days each 2-week period. During the survey, equal numbers (53 each) of weekday morning and evening periods were sampled. On the weekend, 23 morning periods and 24 evening periods were sampled. Thus, a morning or an evening period was sampled on 106 (35%) of 304 possible weekday periods and on 47 (39%) of 122 possible weekend day periods. By chance, two of four holidays were not sampled.

The creel clerk was stationed at the entrance to Driftwood SFA. From this location, the clerk could interview angler parties after they were done fishing and were ready to leave the area. Angler parties were interviewed whether they had caught fish or not. Interview data were not kept separately by pit; however, boat and shore harvest and pressure data were kept separately. Each interview included length of fishing trip, number in fishing party, county of residence, fishing preference, the number (if any), kind, and length (measured to nearest 0.5 in TL) of fish harvested, and the number and length (based on angler's memory) of largemouth bass and muskie released. The clerk also recorded the number of muskie follows. Angler parties were asked questions about their satisfaction with the fishing, why they were fishing at Driftwood SFA, and about their awareness and support of the muskie stocking program. General comments by anglers were also noted.

Instead of the creel clerk leaving the post every 2.5 h and possibly missing interviews, the creel clerk would drive around the pits at the end of the shift and record the number of anglers, using binoculars to determine accurately who was fishing and who was not. Boat and shore anglers were counted separately. After the creel survey was complete, total number of anglers for every

2.5 h was determined by looking at the fishing start and stop times for each recorded interview. These totals and the actual count made at the shift's end by the creel clerk were used to determine fishing pressure.

Fishing pressure, harvest data, and catch-and-release data were expanded using a creel data analysis program based on Hudson and Shipman (1980). Weekday data and weekend day data were expanded separately by month.

Data on species preference, county of residence, and anglers' general comments were not expanded. Length frequencies of harvested fish and weight data, as determined from past fishery surveys in southeastern Indiana, were used to estimate the weight of fish harvested at these pits during this survey.

Most of the interviews conducted during this survey were done at the entrance and, therefore, were for completed fishing trips; however, the creel clerk would occasionally interview angler parties during one trip around the pits before going off duty. Thus, a few interviews are not for complete fishing trips.

Fishery Surveys

A general lake survey was conducted on Sandpiper Pit on June 27 to 28, on Plover Pit on July 18 to 19, and Meadowlark Pit on October 11 to 13, as part of DFW Work Plan 202478 that covers management of fish populations in impoundments. These survey dates were selected to be able to compare with the surveys in 1994. Since Meadowlark was sampled in the fall, catch rates and relative abundance from Meadowlark will not directly be compared with those from the other two surveys in June and July. Some physical and chemical characteristics of the water were measured in the deepest area of each pit according to standard lake survey guidelines (Shipman 2001). Submersed aquatic vegetation was sampled at each pit July 28 through August 2, 2005, using guidelines written by Pearson (2004). A GARMIN GPSmap 76 was used to record the location of the limnological data collection site, aquatic vegetation sample sites, and fish collection sites at each pit. Fishery survey data are reported in appendices 1, 2, and 3.

Fish were collected by using a boat-mounted, pulsed DC electrofishing Smith-Root® unit with two dippers along a portion of the shoreline at night for 0.50 h at Sandpiper, 0.75 h at Plover, and 0.50 h at Meadowlark. At Sandpiper, one trap net and two experimental-mesh gill nets were fished overnight. At Plover, two trap nets and four experimental-mesh gill nets were

fished overnight. At Meadowlark, one trap net and one experimental-mesh gill net were fished overnight. Electrofishing catch rates include all age groups of fish.

All fish collected were measured to the nearest 0.1 in TL. Average weights for fish by half-inch groups for Fish Management District 8 were used to estimate the weight of bluegill, largemouth bass, redear sunfish, black crappie, hybrid sunfish, warmouth, and longear sunfish within the sample. Other fishes were weighed in the field to the nearest 0.01 lb. Fish scale samples were taken from selected species for age and growth analysis. Proportional stock density (PSD) was calculated for bluegill and largemouth bass (Anderson and Neumann 1996). PSD values were calculated using fish caught by electrofishing. The Bluegill Fishing Potential (BGFP) index was used to assess bluegill fishing quality (Ball and Tousignant 1996)

RESULTS

Creel Survey

Fishing Pressure and Harvest Rates

The creel clerk interviewed 1,995 angler parties (3,549 anglers) during the survey. Based on interview data and angler counts, an estimated 10,476 anglers spent 26,108 h fishing at Driftwood SFA (Table 1). Total fishing pressure (boat and shore combined) was estimated at 302 h/acre during the survey. Fishing pressure generally declined from a high of 5,011 h in July to a low of 2,057 h in October. In 1994, fishing pressure was much greater (530 h/acre) (Lehman 1995).

The lowest harvest rate of 0.02 fish/h was observed in July. The best harvest rate of 0.38 fish/h was observed in April. During the 7-month creel survey, the overall harvest rate equaled 0.16 fish/h (Table 1). Although this was a very low harvest rate, it was greater than the rate measured in 1994 (0.11 fish/h) (Lehman 1995).

Angler Preference

To measure their preference, the creel clerk asked one angler in each angler party the following question: "What kind of fish were you fishing for?" Responses from the 1,995 angler parties that were interviewed fit into 18 categories (Table 2).

Most (39%) of the angler parties at Driftwood SFA did not have a preference for any certain kind of fish and said they were fishing for "anything" (Table 2). Twenty-seven percent of

angler parties were fishing for largemouth bass, 9% for bluegill, 6% for crappie, and 6% for channel catfish. Another 9% of angler parties were fishing for various combinations of these four species.

Five percent of angler parties said they were fishing for muskie or some combination with muskie (Table 2). Only 3.7% of the angler parties were fishing specifically for muskie or tiger muskie; however, this is an increase from 1994 when 0.3% of angler parties were specifically fishing for tiger muskie (Lehman 1995). Approximately 1.4% were fishing for muskie in combination with largemouth bass or channel catfish (Table 2). This is not surprising as some of the techniques used to catch these fish would also work for muskie.

A few angler parties were fishing for common carp which are present in all three gravel pits. A 12.5 lb common carp was collected during the fishery survey of Meadowlark Pit in October (Appendix 3).

Harvest by Number and Weight

The creel clerk counted 1,569 fish at Driftwood SFA during the creel survey. After expansion of the data, it is estimated that 4,228 fish weighing 2,082 lbs were harvested during the survey (Table 3). This equals approximately 49 fish/acre and a yield of 24 lbs/acre.

Bluegill ranked first by number (40%) and third by weight (20%) in the harvest (Table 3). They ranged from 3.5 to 9.5 in TL, averaging 6.8 in TL (Table 4), which is 1.0 in longer than the average bluegill harvested in 1994. Approximately 83% of bluegill were 6.0 in or longer (i.e. quality size). Many of the smaller bluegill were harvested for catfish bait. Anglers harvested bluegill at the rate of 0.06 fish/h, which is slightly greater than in 1994 (0.04 fish/h). Bluegill harvest was greatest in May. In 1994, crappie ranked first by number in the harvest followed by bluegill (Lehman 1995).

In 2005, crappie ranked second by number (39%) and first by weight (35%) in the harvest (Table 3). Crappie recorded in the creel are assumed to be mostly black crappie, for white crappie were not collected in the fishery surveys at the three pits, but have been collected in past surveys. Crappie ranged from 5.0 to 16.5 in TL, averaging 9.2 in TL (Table 4). Although this average is nearly an inch shorter than the average crappie harvested in 1994, only three angler parties expressed dissatisfaction due to crappie being too small (Table 7).

Approximately 84% of crappie harvested were 8.0 in or longer (i.e. quality size). Crappie were harvested at the rate of 0.06 fish/h (Table 4). The majority of crappie were harvested in April. On April 6, one boat angler harvested 25 crappie in 1 h and a party of four shore anglers harvested 40 crappie in 2.5 h. In 1994, no anglers interviewed by the creel clerk had harvested a limit of 25 crappie.

Redear sunfish ranked third by number (10%) and fourth by weight (7%) in the harvest (Table 3). They ranged from 5.5 to 10.0 in TL, averaging 7.7 in TL (Table 4), which is 1.2 in longer than the average redear harvested in 1994. Approximately 83% of redear were 7.0 in or longer (i.e. quality size). Anglers harvested redear at the rate of 0.02 fish/h. Redear harvest was greatest in May and September.

Channel catfish ranked fourth in number (9%) and second by weight (28%) in the harvest (Table 3). They ranged from 6.5 to 25.0 in TL, averaging 15.4 in TL (Table 4). The harvest rate was 0.02 catfish/h. Catfish harvest was greatest in August. The harvest may have been underestimated because many catfish anglers were fishing when the creel clerk went off duty at 9:00 or 10:00 PM; therefore, the harvest of 398 catfish (4.6 fish/acre) should be seen as a minimum value for the 7-month survey period.

Largemouth bass ranked sixth by number (1%) and sixth by weight (4%) in the harvest (Table 3). The creel clerk checked only 13 bass during the 7-month survey. From those observations, it was estimated that 38 largemouth bass were harvested. Bass ranged in length from 14.0 to 20.0 in TL, averaging 16.2 in TL (Table 4). Approximately 23% of the bass were 18 in or longer. The harvest rate was less than 0.01 fish/h.

By comparison, in 1994, largemouth bass ranked fourth (4%) by number and third (19%) by weight. It was estimated that 209 largemouth bass were harvested, averaging 16.7 in long. Thirty-two percent of harvested bass were 18 in or longer in 1994. The harvest rate was also less than 0.01 fish/h (Lehman 1995).

Warmouth, hybrid sunfish, muskie, and longear sunfish comprised the remainder of the fish harvest. Two muskies were observed in the fish harvest. One muskie was caught on chicken liver and the other muskie was caught on a bare hook. A gravid female longer than 40 in was found dead on shore in April; cause of death was not apparent to the creel clerk. A 38-in muskie was found dead on shore in May, which was probably a fish that had been caught and

released a few days earlier. Though not in the creel, anglers reported catching a 42-in muskie on April 20, 2005.

Catch and Release Fishing

The creel clerk asked each angler party for the number of legal and sublegal largemouth bass and muskie that had been caught and released. After expansion, it was estimated that anglers released 5,696 bass (Table 5). Approximately 94% were sublegal fish. The catch and release rate was 0.22 bass/h or 66 bass/acre. The total catch rate (catch and release rate plus the harvest rate) for bass was also 0.22 bass/h or 66 bass/acre as only 38 bass were harvested.

Many more sublegal bass were present in 2005 than in 1994. Consequently, the total catch rate for largemouth bass was much greater than in 1995 when it was only 0.05 bass/h or 26 bass/acre (Lehman 1995).

Eight muskie were caught and released, which expanded out to 22 muskie. The catch-and-release rate was less than 0.01 muskie/h or 0.25 muskie/acre (Table 5). The total catch rate (harvest plus release) was less than 0.01 muskie/h or 0.32 muskie/acre. The total catch rate for muskies in 2005 was less than that observed for tiger muskies in 1994 (0.01/h or 4.69/acre) (Lehman 1995).

Anglers reported 101 follows by muskies which expanded to 273 follows during the creel survey (Table 5). This works out to 0.01 follows/h or 3.16 follows/acre.

Angler Origin and Comments

Driftwood SFA is a popular place to fish for local anglers. Of the 1,995 angler parties interviewed during this survey, 45% were from Johnson County and 24% were from Bartholomew County (Table 6). Another 28% came from Marion, Shelby, Brown, Morgan, Jackson, Decatur, and Jennings counties, which are immediately adjacent to Johnson and/or Bartholomew County. Six parties were from out-of-state.

Each angler party was asked the following question, "Are you satisfied with the quality of fishing at this state fishing area?" Quality was not defined in any way. Of the 1,995 parties interviewed, 87% said *yes* and 13% said *no*. In 1994, 94% of angler parties were satisfied (Lehman 1995). Dissatisfied parties were asked, "Why are you dissatisfied with the quality of fishing at this state fishing area?" More than half (59%) said that there were not enough fish

(Table 7); 84% gave the same response in 1994. In 2005, 16% said that the largemouth bass were too small and 4% said that the bluegill were too small. Complaints about the trash, the fishing pressure, the presence of muskie, not enough muskie, and loss of shoreline fishing to brush were included in the “other” category.

It was determined that fishing pressure was heavy at Driftwood SFA in 1985 even though harvest rates were low, so it was recommended that in future creel surveys, anglers be questioned why they continue to fish at Driftwood SFA (Lehman 1987). Thus, in 1994 and 2005, angler parties were asked the following question, "Why do you fish here?" The most important reason for 67% of angler parties in 2005 was that Driftwood SFA was close to home (Table 8); 51% gave the same response in 1994 (Lehman 1995). In 2005, 11% enjoyed the setting and 8% believed it was a good place to fish. To catch a muskie or to even have the chance to catch a muskie was important to 5% of the parties, which is an increase from 1994 (Lehman 1995).

Of those parties interviewed for the first time, the creel clerk asked, “Before today, did you know the DNR is stocking muskie here?” Of those 1,494 parties, 70% were aware of the muskie stocking program. Then the creel clerk would ask, “Do you support the DNR muskie-stocking program at Plover and Sandpiper pits?” Of those same parties, 1,201 (80%) shared their support of the muskie stocking program, 178 (12%) expressed that they did not care, and 114 (8%) said no.

Economic Value of the Driftwood State Fishing Area Fishery

It is estimated that 10,476 anglers fished at Driftwood SFA during this 7-month creel survey. In the most recent survey by the U.S. Fish and Wildlife Service, it was determined that the value of one fishing trip in Indiana is \$36.56 (U.S. Department of the Interior and U.S. Department of Commerce 2002). This is based on the average amount spent by one angler for one trip. At this rate, the estimated economic value of the fishery at these three gravel pits during the creel survey period was approximately \$383,003.

Fishery Surveys

Sandpiper Pit

The water level in Sandpiper Pit appeared to be typical for late June. The Secchi disk reading was 6.3 ft. At the time of the survey, dissolved oxygen concentrations were not adequate for fish survival below 16 ft. Submersed vegetation was found to a maximum depth of 11.5 ft. No species dominated the plant community, but southern naiad, chara, and coontail were found most frequently throughout the pit. Eurasian watermilfoil and curlyleaf pondweed were also collected.

A total of 269 fish, representing 11 species and hybrid sunfish, was collected during this survey. Total weight of the fish sample was approximately 99 lbs. By number, largemouth bass ranked first, bluegill ranked second, and redear sunfish ranked third in the survey sample. By weight, largemouth bass ranked first followed by two common carp and one silver redhorse.

A total of 124 largemouth bass was sampled that weighed 54 lbs. They ranged from 1.9 to 13.4 in TL, averaging 9.2 in TL. Relative abundance was 46% by number and 54% by weight. The electrofishing catch rate was 244.0/h, which is an increase from 124.0/h in 1994 (Lehman 1995). Largemouth did not represent a balanced population; the largemouth PSD was 13, which is a decrease from 19 in 1994. It was not determined when largemouth reached 14 in because legal bass were not collected at Sandpiper. Growth is slightly below average for southeastern Indiana and has declined since 1994 (Figure 2).

A total of 90 bluegill was sampled that weighed 5 lbs. They ranged from 1.2 to 7.8 in TL, averaging 3.0 in TL. Relative abundance was 34% by number and 5% by weight. The electrofishing catch rate was 178.0/h, compared to 254.0/h in 1994 (Lehman 1995). Bluegill did represent a balanced population; the bluegill PSD was 50. The PSD was 17 in 1994. Sixteen percent of the bluegill in this sample were 6.0 in or longer (i.e. quality size). The BGFP index was 13, which is in the fair category as it was in 1994. Growth decreased from 1994 and back-calculated lengths indicate bluegill reached 6 in during their 5th year of growth, which is approximately 1 year below average for southeastern Indiana (Figure 3).

A total of 13 redear sunfish was sampled that weighed 2 lbs. They ranged from 3.5 to 7.9 in TL, averaging 5.6 in TL. Relative abundance was 5% by number and 2% by weight. The electrofishing catch rate was 26.0/h. Only 1 of 13 redear in this sample was 7.0 in or longer (i.e.

quality size). Growth is below average for southeastern Indiana (Figure 4). It was not determined when redear reached 7 in at Sandpiper.

Plover Pit

The water level in Plover Pit appeared to be typical for mid July. The Secchi disk reading was 13.8 ft. At the time of the survey, dissolved oxygen concentrations were not adequate for fish survival below 22 ft. Submersed vegetation was found to a maximum depth of 20 ft. Coontail dominated the plant community, but Eurasian watermilfoil, leafy pondweed, and chara were also found frequently throughout the pit. American elodea, southern naiad, curlyleaf pondweed, sago pondweed, and brittle naiad were also collected.

A total of 157 fish, representing 13 species and hybrid sunfish, was collected during this survey. Total weight of the fish sample was approximately 66 lbs. By number, largemouth bass ranked first, bluegill ranked second, and warmouth ranked third in the survey sample. By weight, largemouth bass ranked first followed by one common carp and one longnose gar.

A total of 63 largemouth bass was sampled that weighed 29 lbs. They ranged from 3.0 to 13.0 in TL, averaging 9.5 in TL. Relative abundance was 40% by number and 44% by weight. The electrofishing catch rate was 64.0/h, which is a 30% increase from 1994 (Lehman 1995). Largemouth did not represent a balanced population; the bass PSD was 2, which is a 94% decrease from 1994. It was not determined when largemouth reached 14 in, because legal bass were not collected at Plover. Growth was similar to 1994 and slightly below average for southeastern Indiana (Figure 5).

A total of 56 bluegill was sampled that weighed 2 lbs. They ranged in length from 0.5 to 7.3 in TL, averaging 3.0 in TL. Relative abundance was 36% by number and 3% by weight. The electrofishing catch rate was 34.7/h, which is an 88% decrease from 1994 (Lehman 1995). Bluegill did represent a balanced population; the bluegill PSD was 31, compared to 6 in 1994. Eleven percent of the bluegill in this sample were 6.0 in or longer (i.e. quality size), which is a 118% increase from 1994. The BGFP index was 9, which is in the marginal category as it was in 1994. Growth was similar to 1994 and back-calculated lengths indicate bluegill reached 6 in near the beginning of their 5th year of growth, which is slightly below average for southeastern Indiana (Figure 6).

Four redear sunfish were collected at Plover. They ranged from 2.3 to 7.4 in TL. Two of the redear were 7.0 in or longer (i.e. quality size). It was not determined when redear reached 7 in at Plover.

Meadowlark Pit

The water level in Meadowlark Pit appeared to be typical for early October. The Secchi disk reading was 10.1 ft. At the time of the survey, dissolved oxygen concentrations were not adequate for fish survival below 12 ft. Submersed vegetation was found to a maximum depth of 9.5 ft. Coontail, southern naiad, and filamentous algae were the only three species collected in the vegetation survey on August 1, 2005. Coontail was collected at nine of ten littoral sites. Brittle naiad, curlyleaf pondweed, and sago pondweed were also observed. Eurasian watermilfoil and leafy pondweed were found at the time of the fishery survey.

A total of 529 fish, representing 14 species and hybrid sunfish, was collected during this survey. Total weight of the fish sample was approximately 112 lbs. By number, bluegill ranked first, largemouth bass ranked second, and redear sunfish third in the survey sample. By weight, largemouth bass ranked first followed by two common carp and ten large gizzard shad.

A total of 375 bluegill was sampled that weighed 14 lbs. They ranged in length from 1.1 to 10.1 in TL, averaging 3.3 in TL. Relative abundance was 71% by number and 12% by weight. The electrofishing catch rate was 666.0/h, which is an increase from 335.1/h in 1994 (Lehman 1995). Bluegill did not represent a balanced population; the bluegill PSD was 5. Three percent of the bluegill in this sample were 6.0 in or longer (i.e. quality size), which is a decrease from 8% in 1994. The BGFP index was 14 (fair), compared to 9 (marginal) in 1994. Growth decreased from 1994 and back-calculated lengths indicate bluegill reached 6 in near the end of their 6th year of growth, which is 2 years below average for southeastern Indiana (Figure 7).

A total of 52 largemouth bass was sampled that weighed 41 lbs. They ranged from 2.4 to 18.1 in TL, averaging 10.7 in TL. Relative abundance was 10% by number and 37% by weight. The electrofishing catch rate was 100.0/h, similar to the catch rate in 1994 (Lehman 1995). Largemouth did represent a balanced population; the largemouth PSD was 53, compared to a PSD of 80 in 1994. Twenty-one percent of bass in the sample were legal fish. Back-calculated lengths indicate largemouth most likely reached 14 in during their 6th year of growth, which is average for southeastern Indiana (Figure 8).

A total of 31 redear sunfish was sampled that weighed 7 lbs. They ranged from 2.9 to 8.5 in TL, averaging 6.5 in TL. Relative abundance was 6% by number and 7% by weight. The electrofishing catch rate was 58.0/h. Eighteen (58%) redear in this sample were 7.0 in or longer (i.e. quality size). Back-calculated lengths indicate redear reached 7 in near the end of their 5th year of growth, which is approximately 1 year below average for southeastern Indiana (Figure 9).

DISCUSSION

From April 1 to October 31, 2005, it was estimated that 10,476 anglers fished for 26,108 h at Driftwood SFA to harvest 4,228 fish (49 fish/acre) that weighed 2,082 lbs (24 lbs/acre). Total fishing pressure equaled a minimum of 302 h/acre and the harvest rate equaled 0.16 fish/h. In 1994, the total fishing pressure was greater (530 h/acre), but the harvest rate was less (0.11 fish/h). In July 2005, the fishing pressure was greatest but the harvest rate was the least. The abundance of crappie harvested in April plays a major role in the 0.38 fish/h harvest rate in April.

The estimated economic value of the fishery at these three gravel pits during the creel survey period was approximately \$383,003. According to the interviews, the typical angler was a satisfied angler from Johnson County that fishes at Driftwood SFA because it is close to home. Out of 1,995 parties interviewed, 87% were satisfied with the fishing experience and 67% fished here because it was convenient and/or close to home.

More than a quarter (27%) of the parties were fishing specifically for largemouth bass, and several parties fished for bass along with other species. Only 13 bass were seen in the harvest, which expanded out to 38 fish; however, it was estimated that nearly 6,000 bass were caught and released. The total bass catch rate was 0.22 fish/h, which equals one bass every 4.5 h. This is four times greater than the 1994 total bass catch rate (0.05 bass/h), but a greater percentage of bass caught in 2005 were sublegal fish. In the fishery survey sample of Plover and Sandpiper, largemouth outnumbered bluegill and were the most abundant fish. At Plover and Sandpiper, largemouth PSD was below the desired range for a balanced fishery as it was in 1994.

Largemouth bass grew slightly faster in Plover than in Sandpiper, but many largemouth in the Plover fishery survey appeared emaciated. Largemouth bass grew slightly faster in Sandpiper than in Meadowlark. Meadowlark, however, has the greatest largemouth PSD and was the only pit where legal bass were collected during the fishery survey. At Meadowlark, the

bass PSD decreased from 80 (i.e. above the desired range) in 1994 to 53 in 2005, which now represents a balanced population. Twenty-one percent of bass in the Meadowlark sample were legal fish.

Compared to 1994, bass electrofishing catch rates increased 97% and 30% at Sandpiper and Plover pits, respectively. Largemouth bass outnumbered all other species in the two largest pits. And, compared to 1994, bluegill electrofishing catch rates have declined 30% and 88% in Sandpiper and Plover pits, respectively.

Largemouth bass in these three gravel pits have been protected with a 14-in minimum size limit since February of 1981. Because of the size limit and consistent reproduction, the numbers of small bass have been increasing and growth has been declining. Bass now appear to be stockpiled under the 14-in size limit in the two largest pits which represent 97% of the water. After largemouth bass, bluegill and crappie were the two species most sought by anglers. Bluegill and crappie ranked one and two in the harvest as they did in 1994. Bluegill also ranked one or two by number in the 2005 fishery surveys, but crappie were apparently under-sampled. The BGFP index was greatest at Meadowlark with a 14, followed by Sandpiper with a 13 and Plover with a 9. According to the BGFP index, Meadowlark had a *marginal* PSD, *poor* growth, and *good* density. Meadowlark was the only pit from which a bluegill longer than 8 in was collected, which contributed to the greatest index of the three pits. Sandpiper had an *excellent* PSD, *marginal* growth, and *fair* density. Plover has a *good* PSD and *marginal* growth, but *poor* density. The conductivity at Plover was lower than the other two pits and difficult to shock, which could explain the lower catch rate (i.e. the *poor* density).

Redear sunfish ranked third by number in the harvest and averaged 7.7 in TL, but few were collected in the fishery surveys. Redear growth was below average for southeastern Indiana. Redear harvest was greatest in May and September.

Channel catfish ranked fourth in number in the harvest and averaged 15.4 in TL. The harvest rate was 0.02 catfish/h. Catfish harvest was greatest in August. The channel catfish population, which is not expected to sustain itself through natural reproduction, is maintained through regular supplemental stockings by DFW personnel.

Tiger muskies had been stocked in Plover for 13 years and Sandpiper for 1 year before 1997 when pure muskies were stocked. Plover Pit is currently stocked with 335 (5/acre) muskie annually. Sandpiper Pit is currently stocked with 85 (5/acre) muskie annually.

Of parties interviewed for the first time, 70% were aware of the muskie-stocking program, and 80% supported it. Five percent of angler parties said they were fishing for muskie or some combination with muskie. Only 3.7% of the angler parties were fishing specifically for muskie or tiger muskie; however, this is an increase from 1994 when 0.3% of angler parties were specifically fishing for tiger muskie (Lehman 1995). Approximately 1.4% were fishing for muskie in combination with largemouth bass or channel catfish (Table 2). This is not surprising as some of the techniques used to catch these fish would also work for muskie.

The largest esocid reported to date was a 54-in tiger muskie which came from Sandpiper Pit in 1993. Tiger muskies were not observed in the harvest in 2005; it is estimated, however, that six muskies were harvested by anglers.

It is estimated that 22 muskies were caught and released which equaled a catch rate of <0.01 muskie/h or 0.25 muskie/acre (Table 5). The total catch rate, which includes caught and released muskies as well as the six harvested muskies, still equaled <0.01 muskie/h but the number of muskies caught per acre improved slightly to 0.35.

RECOMMENDATIONS

- Conduct sequential sampling in the spring to determine a better PSD for largemouth bass and the need for a largemouth bass slot-limit.
- The DFW should continue to stock channel catfish and muskie at Driftwood SFA according to the catfish and muskie stocking programs.
- Submersed vegetation should continue to be monitored, especially the populations of Eurasian watermilfoil. Signs should be posted to warn boaters of the presence of Eurasian watermilfoil and curlyleaf pondweed and to remind them to clean their boats before leaving DSFA for another body of water.

ACKNOWLEDGEMENTS

Special thanks to our creel clerk Jennifer Humphrey for 7 months of dedication and data collection. We greatly appreciate the assistance of personnel from Atterbury State Fish and Wildlife Area and the local conservation and police officers. Thanks also to the anglers who cooperated with our creel clerk. Participation in a creel survey by all anglers, whether they catch fish or not, is essential for an accurate evaluation of fishing pressure, fish harvest, and management programs.

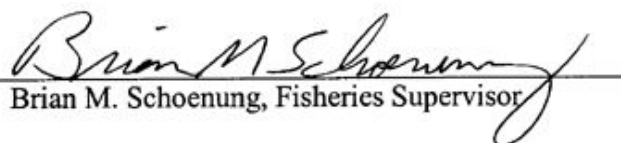
LITERATURE CITED

- Anderson, R. O. and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-481 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.
- Ball, R. L. and J. N. Tousignant. 1996. The development of an objective rating system to assess bluegill fishing in lakes and ponds. Research report. Fisheries Section. Indiana Department of Natural Resources. Indianapolis, Indiana. 18 pp.
- Hudson, G. E. and S. T. Shipman. 1980. Creel survey guidelines. Fisheries Section. Indiana Department of Natural Resources. Indianapolis, Indiana. 12 pp.
- Lehman, L. L. 1987. Creel survey of Driftwood State Fishing Area. 1985 Fish Management Report. Fisheries Section. Indiana Department of Natural Resources. Indianapolis, Indiana. 15 pp.
- Lehman, L. L. 1995. Fish management of the Driftwood State Fishing Area with emphasis on the evaluation of tiger muskellunge stockings in Plover Pit. 1994 Fish Management Report. Fisheries Section. Indiana Department of Natural Resources. Indianapolis, Indiana. 37 pp.
- Pearson, J. 2004. A proposed sampling method to assess occurrence, abundance and distribution of submersed aquatic plants in Indiana lakes. Indiana Division of Fish and Wildlife. Columbia City, Indiana. 37 pp.
- Shipman, S. T. 2001. Manual of fisheries survey methods. Fisheries Section. Indiana Division of Fish and Wildlife. Indianapolis, Indiana. 58 pp.
- U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2002. 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

Submitted by: Clinton R. Kowalik, Assistant Fisheries Biologist

Date: March 20, 2007

Approved by: Larry L. Lehman, Fisheries Biologist

Approved by: 
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Date: January 25, 2008

Table 1. Estimated number of anglers, hours spent fishing, number of fish harvested, and harvest rates by month during the 2005 creel survey at Driftwood SFA. Boat and shore data are combined.

Month	Anglers (#)	Fishing Pressure (h)	Fish Harvested (#)	Harvest Rate (fish/h)
Apr	1,509	3,774	1,423	0.38
May	2,019	4,895	1,148	0.23
Jun	1,849	4,576	361	0.08
Jul	1,968	5,011	115	0.02
Aug	1,113	2,614	282	0.11
Sep	1,179	3,182	475	0.15
Oct	<u>839</u>	<u>2,057</u>	<u>424</u>	0.21
Totals	10,476	*26,108	4,228	0.16

*Total fishing pressure per acre = 26,108 h/86.5 acres = 301.8 h/acre.

Table 2. Preference categories of angler parties at Driftwood SFA from April 1 through October 31, 2005. Boat and shore angler parties are combined.

Preference Category	Angler Parties (#)	Percent
Anything	781	39.1
Largemouth bass	530	26.6
Bluegill	170	8.5
Crappie	125	6.3
Channel catfish	114	5.7
Muskie	72	3.6
Largemouth bass/Bluegill	61	3.1
Panfish	59	3.0
Largemouth bass/Muskie/Tiger muskie	25	1.3
Crappie/Bluegill	15	0.8
Largemouth bass/Crappie	14	0.7
Largemouth bass/Channel catfish	12	0.6
Channel catfish/Bluegill	9	0.5
Common carp	3	0.2
Channel catfish/Muskie/Tiger muskie	2	0.1
Channel catfish/Crappie	1	0.1
Redear sunfish	1	0.1
Tiger muskie	<u>1</u>	<u>0.1</u>
Totals	1,995	100.0

Table 3. Estimated number and weight (lbs) of fishes harvested at Driftwood SFA from April 1 through October 31, 2005.

Species	Number	Percent	Weight	Percent
Bluegill	1,669	39.5	414.55	19.9
Crappie*	1,633	38.6	717.46	34.5
Redear sunfish	405	9.6	146.31	7.0
Channel catfish	398	9.4	587.65	28.2
Warmouth	63	1.5	13.78	0.7
Largemouth bass	38	0.9	87.93	4.2
Hybrid sunfish	11	0.3	4.79	0.2
Muskie	6	0.1	108.42	5.2
Longear sunfish	<u>5</u>	<u>0.1</u>	<u>0.76</u>	<u>0.0</u>
Totals	4,228	100.0	2,081.65	100.0

*Assumed to be mostly black crappie

Table 4. Harvest rates (fish/h), TL range (in), and mean TL (in) for fishes harvested at Driftwood SFA from April 1 through October 31, 2005. The mean TL (in) from 1994 is included for comparison.

Species	Harvest Rate	TL Range	Mean TL	1994 Mean TL
Bluegill	0.06	3.5-9.5	6.8	5.8
Crappie*	0.06	5.0-16.5	9.2	10.1
Redear sunfish	0.02	5.5-10.0	7.7	6.5
Channel catfish	0.02	6.5-25.0	15.4	15.0
Warmouth	<0.01	5.5-8.0	6.4	N/A
Largemouth bass	<0.01	14.0-20.0	16.2	16.7
Hybrid sunfish	<0.01	7.5-9.0	8.3	N/A
Muskie	<0.01	39.0-40.0	39.5	N/A
Longear sunfish	<0.01	5.5-6.0	5.8	N/A

*Assumed to be mostly black crappie

Table 5. Estimated number and catch rates of largemouth bass and muskie caught and released as well as estimated number of muskie follows reported by anglers at Driftwood SFA from April 1 through October 31, 2005.

Species	Estimated Number	Catch Rate (fish/h)	Catch Rate (fish/acre)
Largemouth bass (< 14.0 in TL)	5,364	0.21	62.01
Largemouth bass (\geq 14.0 in TL)	<u>332</u>	0.01	3.84
Total	5,696	0.22	65.85
Muskie (< 36.0 in TL)	5	<0.01	0.06
Muskie (\geq 36.0 in TL)	<u>17</u>	<0.01	0.20
Total	22	<0.01	0.25
Muskie follows per h and acre	273	0.01	3.16

Table 6. Origin of angler parties at Driftwood SFA, April 1 through October 31, 2005.

Indiana County and Other States	Total Number	Percent	Indiana County and Other States	Total Number	Percent
Johnson	905	45.4	Tippecanoe	2	0.1
Bartholomew	482	24.2	Tipton	2	0.1
Marion	320	16.0	Vigo	2	0.1
Shelby	159	8.0	State of Ohio	2	0.1
Brown	31	1.6	Dearborn	1	0.1
Morgan	23	1.2	Dekalb	1	0.1
Hamilton	8	0.4	Delaware	1	0.1
Hancock	7	0.4	Howard	1	0.1
Jackson	7	0.4	Jay	1	0.1
Decatur	5	0.3	Kosciusko	1	0.1
Jennings	5	0.3	LaPorte	1	0.1
Hendricks	4	0.2	Madison	1	0.1
Monroe	4	0.2	Perry	1	0.1
Boone	3	0.2	Putnam	1	0.1
Henry	3	0.2	Rush	1	0.1
Out-of-state*	3	0.2	Scott	1	0.1
Allen	2	0.1	White	1	0.1
St. Joseph	2	0.1	State of Kentucky	<u>1</u>	0.1
			Totals	1,995	

*Out-of-state, not including the states of Ohio and Kentucky

Table 7. Responses by dissatisfied angler parties at Driftwood SFA from April 1 through October 31, 2005 to the question: "Why are you dissatisfied with the quality of fishing at this state fishing area?"

Angler Party Response	Angler Parties (#)	Percent
Not enough fish	151	59.4
Other	50	19.7
Largemouth bass are too small	40	15.7
Bluegill are too small	9	3.5
Crappie are too small	3	1.2
Not enough cover, weeds, etc.	<u>1</u>	<u>0.4</u>
Totals	254	100.0

Table 8. Responses by angler parties at Driftwood SFA from April 1 through October 31, 2005 to the question: "Why do you fish here?"

Angler Party Response	Angler Parties (#)	Percent
Convenient; close to home	1335	66.9
Pleasant, quiet, peaceful, relaxing, fun, remote place	210	10.5
Good place to catch fish	168	8.4
First time here; want to try a new spot	116	5.8
Muskie (i.e. the possibility of catching a muskie)	93	4.7
Family and angler friendly (e.g. good place to take kids, good access, no launch fees, etc.)	<u>73</u>	<u>3.7</u>
Totals	1,995	100.0

[illegible]

**DRIFTWOOD
STATE FISHING
AREA**

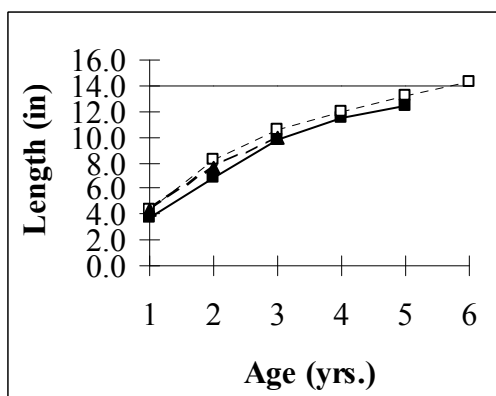


Figure 2. Sandpiper largemouth bass from 2005 survey (solid line) compared to 1994 survey (dashed line) and to average largemouth bass growth observed in Fish Management District 8 impoundments (dotted line). Minimum legal size limit is 14.0 in.

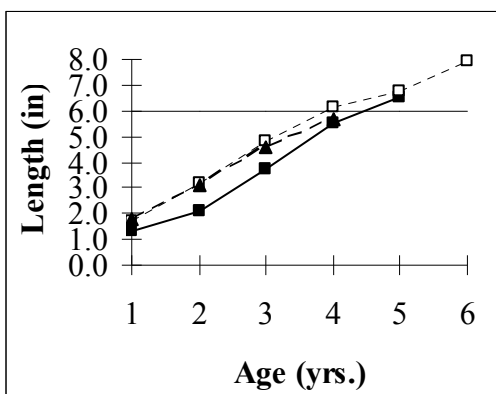


Figure 3. Sandpiper bluegill growth from 2005 survey (solid line) compared to 1994 survey (dashed line) and to average bluegill growth observed in Fish Management District 8 impoundments (dotted line). Quality size bluegill are 6.0 in or longer.

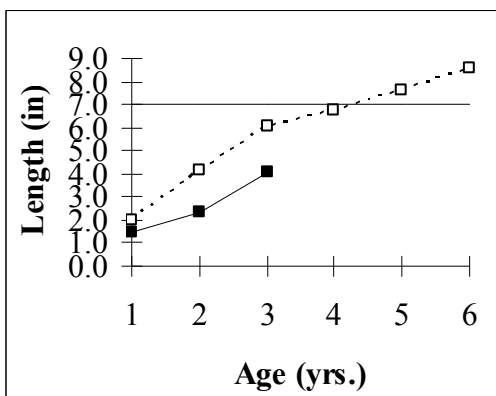


Figure 4. Sandpiper redear sunfish growth from 2005 survey (solid line) compared to average redear sunfish growth observed in Fish Management District 8 impoundments (dotted line). Quality size redear are 7.0 in or longer.

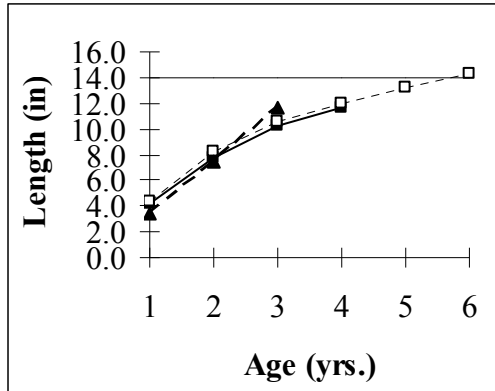


Figure 5. Plover largemouth bass from 2005 survey (solid line) compared to 1994 survey (dashed line) and to average largemouth bass growth observed in Fish Management District 8 impoundments (dotted line). Minimum legal size limit is 14.0 in.

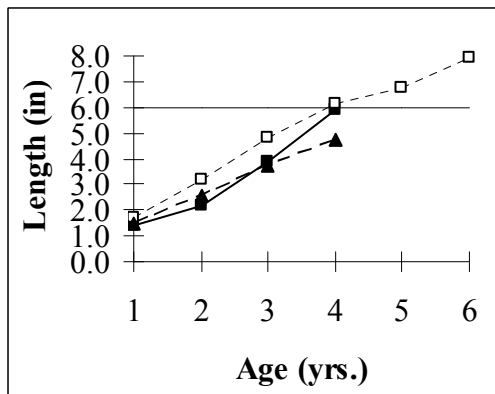


Figure 6. Plover bluegill growth from 2005 survey (solid line) compared to 1994 survey (dashed line) and to average bluegill growth observed in Fish Management District 8 impoundments (dotted line). Quality size bluegill are 6.0 in or longer.

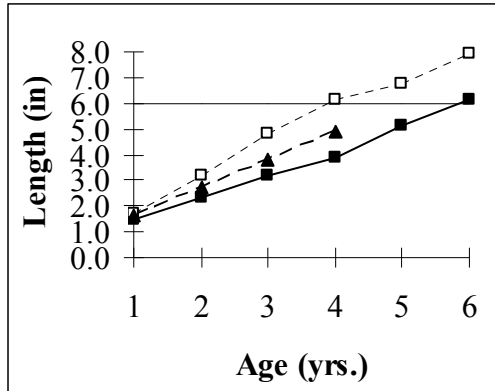


Figure 7. Meadowlark bluegill from 2005 survey (solid line) compared to 1994 survey (dashed line) and to average bluegill growth observed in Fish Management District 8 impoundments (dotted line). Quality size bluegill are 6.0 in or longer.

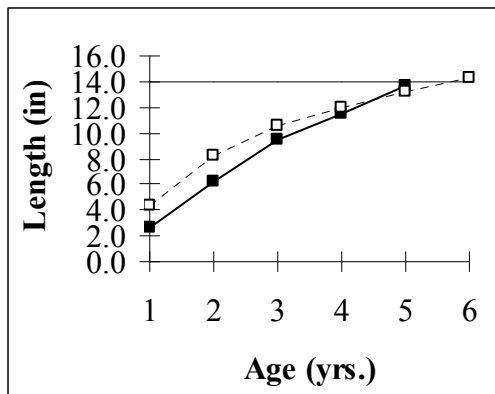


Figure 8. Meadowlark largemouth bass growth from 2005 survey (solid line) compared to average largemouth bass growth observed in Fish Management District 8 impoundments (dotted line). Minimum legal size limit is 14.0 in.

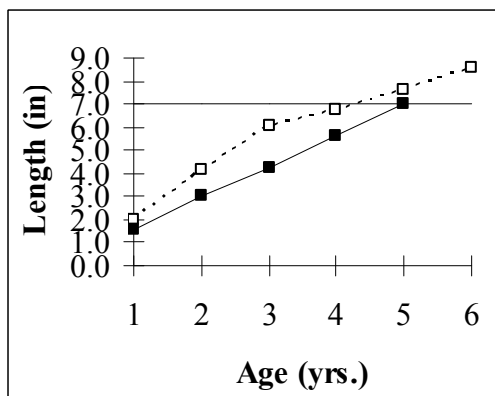


Figure 9. Meadowlark redear sunfish growth from 2005 survey (solid line) compared to average redear sunfish growth observed in Fish Management District 8 impoundments (dotted line). Quality size redear are 7.0 in or longer.

APPENDIX 1

Sandpiper Pit Fish Management Survey Data Pages

LAKE SURVEY REPORT

Type of Survey

☐ Initial Survey☒ Re-Survey

Lake Name	County	Date of survey (Month, day, year)
Sandpiper Pit	Bartholomew	June 27-28, 2005
Biologist's name	Date of Approval (Month, day, year)	
Larry L. Lehman	August 9, 2007	

LOCATION

Quadrangle Name	Range	Section
Edinburgh, IN. 1961. Photorevised 1980	5 E.	4
Township	Nearest Town	
10 N.	Edinburgh	

ACCESSIBILITY

State owned public access site		Privately owned public access site	Other access site		
A one-lane gravel boat ramp is present.		Not applicable	Not applicable		
Surface acres	Maximum depth	Average depth	Volume (Acre feet)	Water level (Feet MSL)	Extreme fluctuations
17	varies*	unknown	unknown	unknown	5 to 6 feet
Location of benchmark					
Approximately 0.8 mile north of Sandpiper Pit on US 31 at bridge over Big Blue River.					

INLETS

Name	Location	Origin
No inlets are present.		

OUTLETS

Name	Location		
No outlets are present.			
Water level control: A low levee at the west end separates the pit from the Driftwood River. Water level in Sandpiper Pit fluctuates with water levels in the ground and the river which occasionally floods around or over the levee.			
POOL	ELEVATION (Feet MSL)	ACRES	Bottom type <input type="checkbox"/> Boulder <input checked="" type="checkbox"/> Gravel <input checked="" type="checkbox"/> Sand <input type="checkbox"/> Muck <input type="checkbox"/> Clay <input type="checkbox"/> Marl
TOP OF DAM	Not applicable		
TOP OF FLOOD CONTROL POOL	Not applicable		
NORMAL POOL			
TOP OF MINIMUM POOL			
STREAMBED			

Watershed use

Outdoor recreation and some agricultural activities.

Development of shoreline

Sandpiper Pit is located within Driftwood State Fishing Area. A road circles most of this pit. Several pull-off areas accommodate shoreline anglers and a one-lane gravel boat ramp is located at the northeast corner of the pit.

At high water levels, Sandpiper Pit is connected to Plover Pit by a small channel.

Previous surveys and investigations

Weekend creel survey 1981; Fisheries survey 1981; Creel survey 1985; Fisheries and Creel survey 1994.

*Water level in Sandpiper Pit varies due to changes in level of ground water and the level of nearby Driftwood River.

SAMPLING EFFORT					
DC ELECTROFISHING	Day hours 0		Night hours 0.50**		Total hours 0.50**
TRAP NETS	Number of traps 1		Number of Lifts 1		Total effort 1 Lift
GILL NETS	Number of nets 2		Number of Lifts 1 lift per net		Total effort 2 Lifts
ROTENONE	Gallons 0	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls none

PHYSICAL AND CHEMICAL CHARACTERISTICS			
Color		Turbidity (Secchi disk)	
Light green		6 Feet	4 Inches
Alkalinity (ppm)*		pH	
Surface: 137-154 Bottom: 171-188		Surface: 8 Bottom: 7.5	
Conductivity:		Air temperature:	
510 micromhos/cm		80 °F	
Water chemistry GPS coordinates:			
N 39.34236791		W -85.98096586	

TEMPERATURE AND DISSOLVED OXYGEN (D.O.)								
DEPTH (FEET)	Degrees (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)
SURFACE	86.0	11.24	36			72		
2	84.4	11.85	38			74		
4	83.7	12.87	40			76		
6	81.7	14.52	42			78		
8	79.2	14.58	44			80		
10	76.5	14.78	46			82		
12	74.3	12.70	48			84		
14	69.8	9.44	50			86		
16	64.9	11.21	52			88		
18	58.1	1.30	54			90		
20	54.5	1.15	56			92		
21 (bottom)	54.1	1.10	58			94		
24			60			96		
26			62			98		
28			64			100		
30			66					
32			68					
34			70					

COMMENTS
**Electrofisher settings = 884 volts pulsed DC, output mode = 60 pps, and pulse width = 4 ms (~6.0 amps).

*ppm-parts per million

Occurrence and Abundance of Submersed Aquatic Plants In Sandpiper Pit

Date:	7/28/05	Littoral sites with plants:	22	Species diversity:	0.84
Littoral depth (ft):	11.5	Number of species:	8	Native diversity:	0.79
Littoral sites:	30	Maximum species/site:	6	Rake diversity:	0.82
Total sites:	30	Mean number species/site:	1.80	Native rake diversity:	0.78
Secchi (ft):	5.0	Mean native species/site:	1.53	*Mean rake score:	0.79

Common Name	Site frequency	Relative density	Mean density	Dominance
Southern naiad	43.3	0.63	1.46	12.7
Chara	40.0	0.53	1.33	10.7
Coontail	26.7	0.37	1.38	7.3
Filamentous algae	20.0			
Sago pondweed	16.7	0.27	1.60	5.3
American elodea	16.7	0.17	1.00	3.3
Eurasian watermilfoil**	16.7	0.17	1.00	3.3
Brittle naiad	10.0	0.10	1.00	2.0
Curlyleaf pondweed**	10.0	0.10	1.00	2.0

Other Observed Plants

SUBMERSED: American pondweed

EMERGENT: American water willow, Marsh purslane, Spikerush (Eleocharis sp.), Willow (Salix sp.)

*Mean rake score includes filamentous algae

**Exotic plant

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER AND WEIGHT					
*COMMON NAME OF FISH	NUMBER	PERCENT	LENGTH RANGE (inches)	WEIGHT (pounds)	PERCENT
Largemouth bass	124	46.1	1.9-13.4	53.56	54.1
Bluegill	90	33.5	1.2-7.8	4.80	4.8
Redear sunfish	13	4.8	3.5-7.9	1.94	2.0
Gizzard shad	12	4.5	9.8-14.8	7.83	7.9
Brook silverside	10	3.7	1.1-4.0	0.06	0.1
Warmouth	7	2.6	5.5-7.0	1.45	1.5
Longear sunfish	5	1.9	3.2-5.3	0.35	0.4
Common carp	2	0.7	27.0-28.7	19.75	19.9
Black crappie	2	0.7	4.5-10.5	0.59	0.6
Hybrid sunfish	2	0.7	6.5-7.0	0.51	0.5
Silver redhorse	1	0.4	26.0	8.00	8.1
Yellow bullhead	1	0.4	7.4	0.21	0.2
Species collected in past surveys include:					
Black bullhead					
Black redhorse					
Bluntnose minnow					
Channel catfish					
Logperch					
Spotted bass					
Spotted sucker					
Tiger muskie					
White crappie					
White sucker					
Totals (11 species & 1 hybrid)	269	100.0		99.05	100.0

*Common names of fishes recognized by the American Fisheries Society.

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Largemouth bass Sandpiper Pit 6/27-28/05									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0	1	0.8	<0.01	0	20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0	1	0.8	0.05	1	23.0				
5.5	2	1.6	0.07	1	23.5				
6.0	7	5.6	0.10	1	24.0				
6.5	6	4.8	0.12	1	24.5				
7.0	10	8.1	0.16	1	25.0				
7.5	7	5.6	0.19	2	25.5				
8.0	7	5.6	0.24	2	26.0				
8.5	7	5.6	0.28	2, 3	TOTAL	124			
9.0	8	6.5	0.34	2, 3					
9.5	16	12.9	0.41	2, 3	PSD = $11/87(100) = 12.6$				
10.0	14	11.3	0.48	2, 3					
10.5	9	7.3	0.57	3	$\% \geq 14.0 \text{ inches} = 0/124(100) = 0.0$				
11.0	8	6.5	0.64	3					
11.5	6	4.8	0.74	3, 4					
12.0	7	5.6	0.84	3, 4					
12.5	3	2.4	0.97	4, 5					
13.0	2	1.6	1.09	5					
13.5	3	2.4	1.24	5					
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									
ELECTROFISHING CATCH		244.0/hr		GILL NET CATCH	1.0/lift		TRAP NET CATCH		0.0/lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Bluegill					Sandpiper Pit		6/27-28/05		
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0	3	3.3	<0.01	1	19.0				
1.5	31	34.4	<0.01	1	19.5				
2.0	17	18.9	<0.01	1	20.0				
2.5	9	10.0	0.01	1, 2	20.5				
3.0	5	5.6	0.02	2	21.0				
3.5	2	2.2	0.03	2	21.5				
4.0					22.0				
4.5	1	1.1	0.06	3	22.5				
5.0	1	1.1	0.08	3	23.0				
5.5	5	5.6	0.11	3, 4	23.5				
6.0	3	3.3	0.15	3, 4	24.0				
6.5	3	3.3	0.19	4, 5	24.5				
7.0	8	8.9	0.24	4, 5	25.0				
7.5	1	1.1	0.30	6	25.5				
8.0	1	1.1	0.38	5	26.0				
8.5					TOTAL	90			
9.0									
9.5						PSD = 13/26(100) = 50.0			
10.0									
10.5						%≥ 6.0 inches = 14/90(100) = 15.6			
11.0									
11.5						Bluegill Fishing Potential Index = 13 (fair)			
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									
ELECTROFISHING CATCH		178.0/hr		GILL NET CATCH	0.5/lift		TRAP NET CATCH		0.0/lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Redear sunfish Sandpiper Pit 6/27-28/05									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5	1	7.7	0.03	2	21.5				
4.0					22.0				
4.5	3	23.1	0.06	2, 3	22.5				
5.0					23.0				
5.5	3	23.1	0.12	3	23.5				
6.0	2	15.4	0.16	3	24.0				
6.5	2	15.4	0.20	3, 4	24.5				
7.0	1	7.7	0.26	3	25.0				
7.5					25.5				
8.0	1	7.7	0.39	5	26.0				
8.5					TOTAL	13			
9.0									
9.5						% \geq 7.0 inches = 1/13(100) = 7.7			
10.0									
10.5									
11.0									
11.5									
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									
ELECTROFISHING CATCH		26.0/hr		GILL NET CATCH	0.0/lift		TRAP NET CATCH	0.0/lift	

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Gizzard shad Sandpiper Pit 6/27-28/05									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5					24.5				
7.0					25.0				
7.5					25.5				
8.0					26.0				
8.5					TOTAL	12			
9.0									
9.5									
10.0	2	16.7	0.34	Gizzard shad were not aged					
10.5	3	25.0	0.40						
11.0									
11.5									
12.0	2	16.7	0.60						
12.5	1	8.3	0.67						
13.0									
13.5	1	8.3	0.87						
14.0	1	8.3	0.94						
14.5	1	8.3	1.08						
15.0	1	8.3	1.19						
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									
ELECTROFISHING CATCH		16.0/hr		GILL NET CATCH	2.0/lift		TRAP NET CATCH	0.0/lift	

Species Largemouth bass	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 0.8"	2004	20	5.2-7.2	4.9							
	2003	23	7.3-10.1	4.0	7.4						
	2002	25	8.7-11.8	3.6	7.0	9.8					
	2001	7	11.3-12.3	3.3	6.8	9.8	11.3				
	2000	5	12.4-13.4	3.3	6.6	9.9	11.7	12.5			
	AVERAGE LENGTH			3.8	6.9	9.8	11.5	12.5			
	NUMBER AGED			80	60	37	12	5			

Species Bluegill	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 0.8"	2004	16	1.2-2.4	1.4							
	2003	11	2.6-3.5	1.3	2.1						
	2002	8	4.5-5.9	1.3	1.9	3.8					
	2001	6	5.5-7.2	1.2	2.2	3.7	5.6				
	2000	5	6.6-7.8	1.4	2.1	3.6	5.5	6.5			
	1999	1*	7.7	1.6	3.4	5.3	6.4	7.0	7.4		
	AVERAGE LENGTH			1.3	2.1	3.7	5.5	6.5			
	NUMBER AGED			46	30	19	11	5			

Species Redear sunfish	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 0.6"											
	2003	2*	3.5-4.6	1.4	2.7						
	2002	9	4.7-6.9	1.5	2.3	4.1					
	2001	1*	6.5	1.6	2.5	5.0	6.0				
	2000	1*	7.9	1.3	2.2	3.7	5.4	7.4			
	AVERAGE LENGTH			1.5	2.3	4.1					
	NUMBER AGED			9	9	9					

Species Black crappie	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 1.4"	2004	1*	4.5	2.9							
	2003	0									
	2002	1*	10.5	3.2	7.6	10.3					
	AVERAGE LENGTH										
	NUMBER AGED										

*Not included in average length calculations.

GPS LOCATION OF SAMPLING EQUIPMENT			Sandpiper Pit			6/27-28/06		
GILL NETS			TRAP NET			ELECTROFISHING		
1	N 39.34298	W -85.98237	1	N 39.34293	W -85.98353	1	N 39.34303	W -85.97938
	N 39.34301	W -85.98139	2	N	W		N 39.34293	W -85.98353
2	N 39.34191	W -85.97970	3	N	W	2	N 39.34293	W -85.98353
	N 39.34240	W -85.98041	4	N	W		N 39.34177	W -85.98184
3	N	W	5	N	W	3	N	W
	N	W	6	N	W		N	W
4	N	W	7	N	W	4	N	W
	N	W	8	N	W		N	W
5	N	W	9	N	W	5	N	W
	N	W	10	N	W		N	W
6	N	W	11	N	W	6	N	W
	N	W	12	N	W		N	W
7	N	W	13	N	W	7	N	W
	N	W	14	N	W		N	W
8	N	W	15	N	W	8	N	W
	N	W	16	N	W		N	W
9	N	W	17	N	W	9	N	W
	N	W	18	N	W		N	W
10	N	W	19	N	W	10	N	W
	N	W	20	N	W		N	W
11	N	W				11	N	W
	N	W					N	W
12	N	W				12	N	W
	N	W					N	W
13	N	W				13	N	W
	N	W					N	W
14	N	W				14	N	W
	N	W					N	W
15	N	W				15	N	W
	N	W					N	W
16	N	W				16	N	W
	N	W					N	W
17	N	W				17	N	W
	N	W					N	W
18	N	W				18	N	W
	N	W					N	W
19	N	W				19	N	W
	N	W					N	W
20	N	W				20	N	W
	N	W					N	W

APPENDIX 2

Plover Pit Fish Management Survey Data Pages

LAKE SURVEY REPORT

Type of Survey	<input type="checkbox"/> Initial Survey	<input checked="" type="checkbox"/> Re-Survey
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Lake Name	County	Date of survey (Month, day, year)
Plover Pit	Bartholomew/Johnson	July 18-19, 2005
Biologist's name	Date of Approval (Month, day, year)	
Larry L. Lehman	August 9, 2007	

LOCATION		
Quadrangle Name	Range	Section
Edinburgh, IN. 1961. Photorevised 1980	5 E.	4 and 33
Township	Nearest Town	
10 N. and 11 N.	Edinburgh	

ACCESSIBILITY					
State owned public access site		Privately owned public access site		Other access site	
Two concrete boat ramps are present.		Not applicable		Not applicable	
Surface acres	Maximum depth	Average depth	Volume (Acre feet)	Water level	Extreme fluctuations
67	varies*	unknown	unknown	unknown	5 to 6 feet
Location of benchmark					
Approximately 0.3 mile north of Plover Pit on US 31 at bridge over Big Blue River					

INLETS		
Name	Location	Origin
No inlets present		

OUTLETS			
Name	Location		
Water level control: A levee along the west side of this pit separates it from the Driftwood River. Water level in Plover Pit fluctuates with water levels in the ground and the river which occasionally floods around the levee.			
POOL	ELEVATION (Feet MSL)	ACRES	Bottom type
TOP OF DAM	Not applicable		<input type="checkbox"/> Boulder
TOP OF FLOOD CONTROL POOL	Not applicable		<input checked="" type="checkbox"/> Gravel
NORMAL POOL			<input checked="" type="checkbox"/> Sand
TOP OF MINIMUM POOL			<input type="checkbox"/> Muck
STREAMBED			<input type="checkbox"/> Clay
			<input type="checkbox"/> Marl

Watershed use
Outdoor recreation and some agricultural activities.
Development of shoreline
Plover Pit is located within Driftwood State Fishing Area. A road circles most of this pit. Several pull-off areas
accommodate shoreline anglers. Two concrete boat ramps are located along the east shoreline. At high water
levels, Plover Pit is connected to Sandpiper Pit by a small channel.
Previous surveys and investigations
Spot-check survey 1979; Weekend creel survey 1981; Fisheries survey 1981; Tiger muskellunge study 1983-1985;
Creel survey 1985; Fishery surveys 1989 and 1991; Fisheries and Creel survey 1994.
*Water level in Plover Pit varies due to changes in level of ground water and nearby Driftwood River water levels.

SAMPLING EFFORT					
DC ELECTROFISHING	Day hours 0		Night hours 0.75**		Total hours 0.75**
TRAP NETS	Number of traps 2		Number of Lifts 1 lift per net		Total effort 2 Lifts
GILL NETS	Number of nets 4		Number of Lifts 1 lift per net		Total effort 4 Lifts
ROTENONE	Gallons 0	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls none

PHYSICAL AND CHEMICAL CHARACTERISTICS			
Color		Turbidity (Secchi disk)	
Light green		13 Feet	9 Inches
Alkalinity (ppm)*		pH	
Surface: 137-154 Bottom: 171-188		Surface: 8.3 Bottom: 7.8	
Conductivity:		Air temperature:	
340 micromhos/cm		89 °F	
Water chemistry GPS coordinates:			
N 39.34610347		W -85.98460151	

TEMPERATURE AND DISSOLVED OXYGEN (D.O.)								
DEPTH (FEET)	Degrees (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)
SURFACE	83.7	9.18	36			72		
2	83.7	9.20	38			74		
4	83.5	9.25	40			76		
6	82.9	9.50	42			78		
8	82.2	9.52	44			80		
10	81.9	9.60	46			82		
12	81.3	9.85	48			84		
14	80.8	10.10	50			86		
16	80.1	9.25	52			88		
18	77.4	6.88	54			90		
20	73.6	4.95	56			92		
22	70.3	3.37	58			94		
24	68.4	1.25	60			96		
26	66.9	1.20	62			98		
28 (bottom)	66.4	1.16	64			100		
30			66					
32			68					
34			70					

COMMENTS
**Electrofisher settings = 1061 volts pulsed DC, output mode = 60 pps, and pulse width = 4 ms (~5.0 amps).

*ppm-parts per million

Occurrence and Abundance of Submersed Aquatic Plants in Plover Pit

Date: 8/1-2/2005	Littoral sites with plants:	39	Species diversity:	0.85
Littoral depth (ft): 20.0	Number of species:	9	Native diversity:	0.80
Littoral sites: 39	Maximum species/site:	8	Rake diversity:	0.78
Total sites: 40	Mean number species/site:	3.54	Native rake diversity:	0.70
Secchi (ft): 13.0	Mean native species/site:	2.74	*Mean rake score:	2.05

Common Name	Site frequency	Relative density	Mean density	Dominance
Coontail	87.2	2.69	3.09	53.8
Eurasian watermilfoil**	53.8	1.08	2.00	21.5
Leafy pondweed	53.8	0.77	1.43	15.4
Chara	51.3	1.38	2.70	27.7
American elodea	28.2	0.31	1.09	6.2
Southern naiad	25.6	0.31	1.20	6.2
Curlyleaf pondweed**	25.6	0.26	1.00	5.1
Sago pondweed	15.4	0.15	1.00	3.1
Brittle naiad	12.8	0.15	1.20	3.1

Other Observed Plants

SUBMERSED: American pondweed

EMERGENT: American water willow

*Mean rake score includes filamentous algae

**Exotic plant

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER AND WEIGHT					
*COMMON NAME OF FISH	NUMBER	PERCENT	LENGTH RANGE (inches)	WEIGHT (pounds)	PERCENT
Largemouth bass	63	40.1	3.0-13.0	29.35	44.4
Bluegill	56	35.7	0.5-7.3	2.17	3.3
Warmouth	11	7.0	2.2-6.7	0.96	1.5
Gizzard shad	6	3.8	11.4-15.7	5.45	8.3
Channel catfish	5	3.2	11.0-27.0	5.59	8.5
Redear sunfish	4	2.5	2.3-7.4	0.71	1.1
Longear sunfish	3	1.9	3.0-4.1	0.11	0.2
Black crappie	2	1.3	5.3-9.3	0.54	0.8
Brook silverside	2	1.3	2.1-2.3	<0.01	<0.1
Common carp	1	0.6	28.0	12.38	18.7
Longnose gar	1	0.6	42.5	8.25	12.5
Rock bass	1	0.6	7.0	0.27	0.4
Hybrid sunfish	1	0.6	7.0	0.26	0.4
Spotfin shiner	1	0.6	2.4	<0.01	<0.1
Species collected in past surveys include:					
Black redhorse					
Bluntnose minnow					
Logperch					
Shorthead redhorse					
Spotted bass					
Spotted sucker					
Tiger muskie					
White crappie					
White sucker					
Totals (13 species & 1 hybrid)	157	100.0		66.04	100.0

*Common names of fishes recognized by the American Fisheries Society.

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Largemouth bass Plover Pit 7/18-19/05									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0	1	1.6	0.01	0	21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5	4	6.3	0.07	1	23.5				
6.0	3	4.8	0.10	1	24.0				
6.5	1	1.6	0.12	1	24.5				
7.0					25.0				
7.5					25.5				
8.0	1	1.6	0.24	2	26.0				
8.5	7	11.1	0.28	2	TOTAL	63			
9.0	5	7.9	0.34	2, 3					
9.5	5	7.9	0.41	2, 3		PSD = $1/42(100) = 2.4$			
10.0	6	9.5	0.48	2, 3					
10.5	12	19.0	0.57	3		% \geq 14.0 inches = $0/63(100) = 0.0$			
11.0	9	14.3	0.64	3					
11.5	6	9.5	0.74	3, 4					
12.0	2	3.2	0.84	3, 4					
12.5									
13.0	1	1.6	1.09	4					
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									
ELECTROFISHING CATCH		64.0/hr		GILL NET CATCH	3.5/lift		TRAP NET CATCH		0.5/lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Bluegill Plover Pit 7/18-19/05									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0	3	5.4	<0.01	0	19.0				
1.5	5	8.9	<0.01	1	19.5				
2.0	17	30.4	<0.01	1	20.0				
2.5	11	19.6	0.01	1, 2	20.5				
3.0	8	14.3	0.02	2	21.0				
3.5	1	1.8	0.03	2	21.5				
4.0					22.0				
4.5					22.5				
5.0	1	1.8	0.08	3	23.0				
5.5	2	3.6	0.11	3	23.5				
6.0	4	7.1	0.15	3, 4	24.0				
6.5	1	1.8	0.19	—	24.5				
7.0	2	3.6	0.24	4	25.0				
7.5	1	1.8	0.30	5	25.5				
8.0					26.0				
8.5					TOTAL	56			
9.0									
9.5						PSD = $4/13(100) = 30.8$			
10.0									
10.5						% \geq 6.0 inches = $6/56(100) = 10.7$			
11.0									
11.5						Bluegill Fishing Potential Index = 9 (marginal)			
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									
ELECTROFISHING CATCH		34.7/hr		GILL NET CATCH	0.8/lift		TRAP NET CATCH		13.5/lift

Species Largemouth bass	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 0.8"	2004	8	5.3-6.6	4.3							
	2003	14	8.2-10.0	4.1	8.1						
	2002	21	8.9-11.9	4.0	7.6	10.1					
	2001	3	11.6-13.0	4.5	7.8	10.3	11.6				
	AVERAGE LENGTH			4.2	7.8	10.2	11.6				
	NUMBER AGED			46	38	24	3				

Species Bluegill	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 0.8"	2004	15	1.3-2.5	1.5							
	2003	8	2.3-3.3	1.4	2.1						
	2002	6	5.0-6.0	1.3	2.1	3.6					
	2001	3	6.1-7.0	1.4	2.4	4.3	5.9				
	2000	1*	7.3	1.3	2.1	3.0	4.0	6.0			
	AVERAGE LENGTH			1.4	2.2	3.9	5.9				
	NUMBER AGED			32	17	9	3				

Species Redear sunfish	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 0.6"	2004	0									
	2003	0									
	2002	1*	5.5	1.6	2.3	3.2					
	2001	0									
	2000	2*	7.0-7.4	1.5	2.0	3.2	4.7	6.9			
	AVERAGE LENGTH										
	NUMBER AGED										

Species Black crappie	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 1.4"	2004	1*	5.3	3.2							
	2003	0									
	2002	1*	9.3	2.9	7.0	8.3					
	AVERAGE LENGTH										
	NUMBER AGED										

*Not included in average length calculations.

GPS LOCATION OF SAMPLING EQUIPMENT						Plover Pit		7/18-19/05	
GILL NETS			TRAP NETS			ELECTROFISHING			
1	N 39.34968	W -85.98142	1	N 39.34938	W -85.98490	1	N 39.34626	W 85.98190	
	N 39.34961	W -85.98225	2	N 39.34766	W -85.98544		N 39.34815	W -85.98593	
2	N 39.34892	W -85.98319	3	N	W	2	N 39.34815	W -85.98593	
	N 39.34974	W -85.98366	4	N	W		N 39.34925	W -85.98238	
3	N 39.34641	W -85.98636	5	N	W	3	N 39.34646	W -85.98626	
	N 39.34705	W -85.98649	6	N	W		N 39.34328	W -85.98388	
4	N 39.34419	W -85.98117	7	N	W	4	N	W	
	N 39.34462	W -85.98177	8	N	W		N	W	
5	N	W	9	N	W	5	N	W	
	N	W	10	N	W		N	W	
6	N	W	11	N	W	6	N	W	
	N	W	12	N	W		N	W	
7	N	W	13	N	W	7	N	W	
	N	W	14	N	W		N	W	
8	N	W	15	N	W	8	N	W	
	N	W	16	N	W		N	W	
9	N	W	17	N	W	9	N	W	
	N	W	18	N	W		N	W	
10	N	W	19	N	W	10	N	W	
	N	W	20	N	W		N	W	
11	N	W				11	N	W	
	N	W					N	W	
12	N	W				12	N	W	
	N	W					N	W	
13	N	W				13	N	W	
	N	W					N	W	
14	N	W				14	N	W	
	N	W					N	W	
15	N	W				15	N	W	
	N	W					N	W	
16	N	W				16	N	W	
	N	W					N	W	
17	N	W				17	N	W	
	N	W					N	W	
18	N	W				18	N	W	
	N	W					N	W	
19	N	W				19	N	W	
	N	W					N	W	
20	N	W				20	N	W	
	N	W					N	W	

APPENDIX 3

Meadowlark Pit Fish Management Survey Data Pages

LAKE SURVEY REPORT

Type of Survey	<input type="checkbox"/> Initial Survey	<input checked="" type="checkbox"/> Re-Survey
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Lake Name Meadowlark Pit	County Bartholomew/Johnson	Date of survey (Month, day, year) October 11-13, 2005
Biologist's name Larry L. Lehman		Date of Approval (Month, day, year) August 9, 2007

LOCATION		
Quadrangle Name Edinburgh, IN. 1961. Photorevised 1980	Range 5 E.	Section 4 and 33
Township 10 N. and 11 N.	Nearest Town Edinburgh	

ACCESSIBILITY					
State owned public access site A one-lane gravel boat ramp is present.		Privately owned public access site Not applicable		Other access site Not applicable	
Surface acres 2.5	Maximum depth varies*	Average depth unknown	Volume (Acre feet) unknown	Water level (Feet MSL) unknown	Extreme fluctuations 5 to 6 feet
Location of benchmark Approximately 0.7 mile north of Meadowlark Pit on US 31 at bridge over Big Blue River.					

INLETS		
Name No inlets are present.	Location	Origin

OUTLETS																
Name No outlets are present.	Location															
Water level control: No outlet or water control structure is present. The Driftwood River has gone around the levee on the west side of the property and flooded Meadowlark Pit occasionally in the past.																
POOL	ELEVATION (Feet MSL)	ACRES														
TOP OF DAM	Not applicable															
TOP OF FLOOD CONTROL POOL	Not applicable															
NORMAL POOL																
TOP OF MINIMUM POOL																
STREAMBED																
<table border="1"> <tr> <th colspan="2">Bottom type</th> </tr> <tr> <td><input type="checkbox"/></td> <td>Boulder</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Gravel</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Sand</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Muck</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Clay</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Marl</td> </tr> </table>			Bottom type		<input type="checkbox"/>	Boulder	<input checked="" type="checkbox"/>	Gravel	<input checked="" type="checkbox"/>	Sand	<input type="checkbox"/>	Muck	<input type="checkbox"/>	Clay	<input type="checkbox"/>	Marl
Bottom type																
<input type="checkbox"/>	Boulder															
<input checked="" type="checkbox"/>	Gravel															
<input checked="" type="checkbox"/>	Sand															
<input type="checkbox"/>	Muck															
<input type="checkbox"/>	Clay															
<input type="checkbox"/>	Marl															

Watershed use Outdoor recreation and some agricultural activities.
Development of shoreline A one-lane gravel boat ramp is located at the south end of the Meadowlark Pit. Several access lanes and auto pull-offs are located along the west shore. Meadowlark Pit is located within Driftwood State Fishing Area.
Previous surveys and investigations Weekend creel survey 1981; Fisheries survey 1981; Renovated and restocked 1982; Spot-check survey 1983; Creel survey 1985; Fisheries survey 1991; Fisheries and Creel survey 1994.
*Water level in Meadowlark Pit fluctuates with water levels in nearby Driftwood River and with ground water levels.

SAMPLING EFFORT**					
DC ELECTROFISHING	Day hours 0		Night hours 0.50***		Total hours 0.50***
TRAP NETS	Number of traps 1		Number of Lifts 1		Total effort 1 Lift
GILL NETS	Number of nets 1		Number of Lifts 1		Total effort 1 Lift
ROTENONE	Gallons 0	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls none

PHYSICAL AND CHEMICAL CHARACTERISTICS			
Color		Turbidity (Secchi disk)	
Light green		10 Feet	1 Inch
Alkalinity (ppm)*		pH	
Surface: 205 Bottom: 205		Surface: 7.8 Bottom: 7.8	
Conductivity:		Air temperature:	
510 micromhos/cm		64 °F	
Water chemistry GPS coordinates:			
N 39.34345772		W -85.97982818	

TEMPERATURE AND DISSOLVED OXYGEN (D.O.)								
DEPTH (FEET)	Degrees (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)
SURFACE	63.5	8.63	36			72		
2	63.3	8.56	38			74		
4	63.1	8.30	40			76		
6	63.0	7.98	42			78		
8	62.6	7.70	44			80		
10	62.6	7.69	46			82		
12	62.6	7.47	48			84		
13 (bottom)	62.6	1.20	50			86		
16			52			88		
18			54			90		
20			56			92		
22			58			94		
24			60			96		
26			62			98		
28			64			100		
30			66					
32			68					
34			70					

COMMENTS
**No sampling of any kind was done in the long, narrow channel in northern part of pit because a beaver dam blocked access.
***Electrofisher settings = 884 volts pulsed DC, output mode = 60 pps, and pulse width = 4 ms (5.0 amps).
*ppm-parts per million

Occurrence and Abundance of Submersed Aquatic Plants in Meadowlark Pit

Date:	8/1/05	Littoral sites with plants:	10	Species diversity:	0.46
Littoral depth (ft):	9.5	Number of species:	2	Native diversity:	0.46
Littoral sites:	10	Maximum species/site:	2	Rake diversity:	0.45
Total sites:	11	Mean number species/site:	1.40	Native rake diversity:	0.45
Secchi (ft):	4.7	Mean native species/site:	1.40	*Mean rake score:	2.09

Common Name	Site frequency	Relative density	Mean density	Dominance
Coontail	90.0	2.80	3.11	56.0
Southern naiad	50.0	1.50	3.00	30.0
Filamentous algae	20.0			

Other Observed Plants

Submersed: Brittle naiad, Curlyleaf pondweed**, Eurasian watermilfoil**, Leafy pondweed, and Sago pondweed.

Emergent: Creeping water primrose, Willow (Salix sp.)

*Mean rake score includes filamentous algae

**Exotic plant

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER AND WEIGHT					
*COMMON NAME OF FISH	NUMBER	PERCENT	LENGTH RANGE (inches)	WEIGHT (pounds)	PERCENT
Bluegill	375	70.9	1.1-10.1	13.53	12.1
Largemouth bass	52	9.8	2.4-18.1	41.00	36.7
Redear sunfish	31	5.9	2.9-8.5	7.49	6.7
Warmouth	20	3.8	3.1-9.1	4.81	4.3
Brook silverside	14	2.6	1.8-3.3	0.06	0.1
Hybrid sunfish	12	2.3	2.5-8.1	2.02	1.8
Gizzard shad	10	1.9	14.6-16.9	15.25	13.6
Channel catfish	5	0.9	11.8-15.1	2.89	2.6
Black crappie	3	0.6	5.4-10.0	0.76	0.7
Common carp	2	0.4	27.9-30.5	23.70	21.2
Golden shiner	1	0.2	8.0	0.16	0.1
Redfin pickerel (formerly known as grass pickerel)	1	0.2	7.5	0.09	0.1
Longear sunfish	1	0.2	4.7	0.07	0.1
Logperch	1	0.2	4.6	0.03	<0.1
Orangethroat darter	1	0.2	1.8	<0.01	<0.1
Species collected in past surveys include:					
Bigmouth buffalo					
Black bullhead					
River carpsucker					
Spotted sucker					
Tiger muskie					
White crappie					
White sucker					
Yellow bullhead					
Totals (14 species & 1 hybrid)	529	100.0		111.86	100.0

*Common names of fishes recognized by the American Fisheries Society.

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Bluegill Meadowlark Pit 10/11-13/05									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0	3	0.8	<0.01	0	19.0				
1.5	7	1.9	<0.01	0	19.5				
2.0	58	15.5	<0.01	1	20.0				
2.5	60	16.0	0.01	1, 2	20.5				
3.0	94	25.1	0.02	2	21.0				
3.5	51	13.6	0.03	2	21.5				
4.0	16	4.3	0.04	2, 3, 4	22.0				
4.5	26	6.9	0.06	4	22.5				
5.0	27	7.2	0.08	3, 4	23.0				
5.5	23	6.1	0.11	3, 4	23.5				
6.0	4	1.1	0.15	6, 7	24.0				
6.5	4	1.1	0.19	5, 6	24.5				
7.0	1	0.3	0.24	6	25.0				
7.5					25.5				
8.0					26.0				
8.5					TOTAL	375			
9.0									
9.5						PSD = 10/197(100) = 5.1			
10.0	1	0.3	0.75	—					
10.5						%≥ 6.0 inches = 10/375(100) = 2.7			
11.0									
11.5						Bluegill Fishing Potential Index = 14 (fair)			
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									
ELECTROFISHING CATCH		666.0/hr		GILL NET CATCH	1.0/lift		TRAP NET CATCH		41.0/lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Largemouth bass Meadowlark Pit 10/11-13/05									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5	1	1.9	0.01	0	20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0	1	1.9	0.05	1	23.0				
5.5					23.5				
6.0	2	3.8	0.10	1	24.0				
6.5	3	5.8	0.12	1	24.5				
7.0	5	9.6	0.16	1	25.0				
7.5					25.5				
8.0	2	3.8	0.24	1	26.0				
8.5					TOTAL	52			
9.0	6	11.5	0.34	2					
9.5	3	5.8	0.41	2		PSD = 20/38(100) = 52.6			
10.0	1	1.9	0.48	2					
10.5	5	9.6	0.57	2, 3		%≥ 14.0 inches = 11/52(100) = 21.2			
11.0	1	1.9	0.64	4					
11.5	2	3.8	0.74	4					
12.0	2	3.8	0.84	4					
12.5	3	5.8	0.97	4					
13.0	3	5.8	1.09	4					
13.5	1	1.9	1.24	4					
14.0	2	3.8	1.39	4, 5					
14.5	2	3.8	1.59	5					
15.0	2	3.8	1.72	5					
15.5	1	1.9	1.93	—					
16.0	1	1.9	2.06	—					
16.5	1	1.9	2.29	—					
17.0	1	1.9	2.40	—					
17.5									
18.0	1	1.9	3.20	—					
18.5									
ELECTROFISHING CATCH		100.0/hr		GILL NET CATCH	2.0/lift		TRAP NET CATCH		0.0/lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Redear sunfish Meadowlark Pit 10/11-13/05									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0	1	3.2	0.02	1	21.0				
3.5					21.5				
4.0	2	6.5	0.04	1, 2	22.0				
4.5	5	16.1	0.06	2	22.5				
5.0	2	6.5	0.09	2	23.0				
5.5	1	3.2	0.12	2	23.5				
6.0					24.0				
6.5					24.5				
7.0	6	19.4	0.26	3, 4, 5	25.0				
7.5	5	16.1	0.32	5, 6	25.5				
8.0	7	22.6	0.39	5	26.0				
8.5	2	6.5	0.45	5, 6	TOTAL	31			
9.0									
9.5						%≥ 7.0 inches = 18/31(100) = 58.1			
10.0									
10.5									
11.0									
11.5									
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									
ELECTROFISHING CATCH		58.0/hr		GILL NET CATCH	1.0/lift		TRAP NET CATCH		1.0/lift

Species Bluegill	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 0.8"	2004	8	1.8-2.5	1.6							
	2003	13	2.6-3.9	1.5	2.4						
	2002	3	4.2-5.3	1.5	2.6	3.8					
	2001	15	4.0-5.7	1.3	1.8	2.7	3.7				
	2000	1*	6.3	1.3	1.8	2.2	3.8	5.7			
	1999	4	6.0-6.9	1.5	2.2	3.0	4.1	5.1	6.1		
	1998	1*	6.2	1.5	2.3	3.2	3.9	4.8	5.3	5.9	
	AVERAGE LENGTH			1.5	2.3	3.2	3.9	5.1	6.1		
	NUMBER AGED			43	35	22	19	4	4		

Species Largemouth bass	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 0.8"	2004	11	5.2-8.0	2.7							
	2003	10	8.8-10.4	2.5	6.5						
	2002	3	10.5-10.7	2.8	5.5	8.7					
	2001	11	10.8-14.0	2.8	6.6	9.1	10.7				
	2000	4	14.2-14.9	2.5	6.0	10.4	12.3	13.6			
	AVERAGE LENGTH			2.7	6.2	9.4	11.5	13.6			
	NUMBER AGED			39	28	18	15	4			

Species Redear sunfish	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 0.6"	2004	2*	2.9-4.0	1.8							
	2003	9	4.2-5.5	1.6	3.1						
	2002	1*	6.8	1.4	3.5	4.9					
	2001	1*	7.1	1.5	3.5	5.5	6.6				
	2000	10	7.2-8.5	1.6	2.9	4.2	5.6	7.0			
	1999	2*	7.6-8.3	1.5	2.8	4.0	5.4	6.3	7.6		
	AVERAGE LENGTH			1.6	3.0	4.2	5.6	7.0			
	NUMBER AGED			19	19	10	10	10			

Species Black crappie	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 1.4"	2004	1*	5.4	2.8							
	2003	1*	6.9	2.5	4.6						
	2002	0									
	2001	0									
	2000	1*	10.0	2.7	5.3	6.1	7.0	9.1			
	AVERAGE LENGTH										
	NUMBER AGED										

*Not included in average length calculations.

GPS LOCATION OF SAMPLING EQUIPMENT						Meadowlark Pit		10/11-13/06	
GILL NET			TRAP NET			ELECTROFISHING*			
1	N 39.34492	W -85.97940	1	N 39.34493	W -85.97966	1	N 39.34338	W -85.97970	
	N 39.34429	W -85.97959	2	N	W		N	W	
2	N	W	3	N	W	2	N	W	
	N	W	4	N	W		N 39.34338	W -85.97970	
3	N	W	5	N	W	3	N	W	
	N	W	6	N	W		N	W	
4	N	W	7	N	W	4	N	W	
	N	W	8	N	W		N	W	
5	N	W	9	N	W	5	N	W	
	N	W	10	N	W		N	W	
6	N	W	11	N	W	6	N	W	
	N	W	12	N	W		N	W	
7	N	W	13	N	W	7	N	W	
	N	W	14	N	W		N	W	
8	N	W	15	N	W	8	N	W	
	N	W	16	N	W		N	W	
9	N	W	17	N	W	9	N	W	
	N	W	18	N	W		N	W	
10	N	W	19	N	W	10	N	W	
	N	W	20	N	W		N	W	
11	N	W	*Pulsed DC nighttime electrofishing station one started at boat ramp and station two ended back at the boat ramp. Stations one and two were contiguous.			11	N	W	
	N	W					N	W	
12	N	W				12	N	W	
	N	W					N	W	
13	N	W				13	N	W	
	N	W					N	W	
14	N	W				14	N	W	
	N	W					N	W	
15	N	W				15	N	W	
	N	W					N	W	
16	N	W				16	N	W	
	N	W					N	W	
17	N	W				17	N	W	
	N	W					N	W	
18	N	W				18	N	W	
	N	W					N	W	
19	N	W				19	N	W	
	N	W					N	W	
20	N	W				20	N	W	
	N	W					N	W	